STATINTL

Reply to [redacted] Comments

1.1 Installations considerations are described in the customer's Installation Form. A preliminary copy of this was delivered 3 May 1966. A final copy will follow shortly.

Since it is beyond the bounds of our authority to alter the customer's premisis, the customer will prepare the installation sight. It will probably be in the best interest of both the vendor and customer that installation be a joint effort wherever there is a customer-vendor interface (i.e. power hook up, exhaust duct hook up, etc.).

The unit will be customer property at the conclusion of the acceptance test called out in 3.4.1 of the "Specification of a Chip Printer", 7 July 1965. Since the acceptance test includes a 30 day operational period, the customer need only accept consignee responsibility until the acceptance testing and 30 day period are over.

2.6.2 This paragraph indicates that for any one particular target, the unit will produce not less than six identical prints in one minute with a design objective of ten identical exposures of the same target in one minute. Neither rate refers to a target to target exposure rate.

The rates called out in 2.6.2 are based upon study phase results which indicated that this range of rates is the highest that can be achieved without using unnecessarily sophisticated nonlinear indexing mechanism and larger motors and without having to perform stress investigations on all but critical components.

2.7 Paragraphs 2.7.3 and 2.7.4 do describe the positioning accuracy of the X (0.3 mm) and Y (0.1 mm) respectively.

It is our understanding that this accuracy is required of our unit so that it will be compatible with the rest of the system.

As far as economy is concerned, unless the specified accuracies become so tight that the servos are driven to difficulties with nonlinear instabilities, or on the other hand, so loose as to be in the realm of the unreasonable a change in accuracy will only be significant when the position of the last

decimal digit is altered. For example, to increase a specification from 0.3mm to 0.9mm would not generate a significant price reduction since the BCD digital circuitsmust be capable of handling tenths of millimeters in either case. If however, there was a change of from 0.9 (or 0.3) to 1.1 millimeters (or 1.3 or for that matter 9.9 millimeters) there would be a reduction in digital circuit costs since one less binary coded decimal word (tenths of millimeter) would need be handled by the control and servo comparator circuits.

Hence except where a specification change is large enough to remove a significant decimal digit, the assumption that cost is inversely proportional to tolerance is not valid for 2.7.3 and 2.7.4.

Paragraph 2.7.9 indicates that the Chip Printer will be able to be used as a mensuration device with an accuracy of 0.5 mm.

2.9 The 12% deviation referred to in 2.9 represents the target resolution change per sub group of a standard USAF 1951 Resolving Power Test Target. The resolution change per sub group is a factor $\sqrt[6]{2}$. This number $6\sqrt{2}$ is a typographical error.

Resolution was not stated as based on knowledge of a particular film because it is anticipated that more than one variety of film will be used in the unit. In addition, tying the specification to a particular film (or number of films) would exclude from the specification any superior films that may have been in the preproduction stages (and therefore had unpublished data) at the time of the specification or contract.

2.16 Ninety percent duty cycle means 90% up time. The capability will be demonstrated during customer acceptance by recording unit "up time" and "down time" (i.e., time to clear malfunction, trouble shoot and repair).

MTBF values only evaluate reliability from the standpoint of statistical failure rate of known components under certain stress conditions. It will predict failure due to component failure in a large number of units over a long period of time. However, it does not consider good (or bad) design, engineering or fabrication. Hence, it is possible to have a unit with a very high statisically derived MTBF and with a very high malfunction rate (caused by poor design, engineering, or fabrication). Particularly in prototype equipment, high

MTBF does not necessarily insure low down time.

2.17 Assuming a forty hour work week, service life will be two and one half years. Performance will be considered degraded when the unit falls below the performance requirements of the specification.

Normal mortality in 2.17 refers to the anticipated expenditure or failure of components and material that cannot reasonably be expected to survive through the service life of the unit without going to huge internal storage areas, component redundancy and exorbitantly costly components (e.g., gate liquid, cronapress, indicator lights, exposure lamps and relays that have high operation rate per target).

Cost per unit of service time is a very good measure of dollar value for production item purchases, for example desk typewriters or automobiles. However, development or prototype items might perhaps be better evaluated on the basis of cost as a function of utility, cost as a function of urgency or cost as a function of complexity. (The fallacy of using the cost per unit of service life to judge prototype or small lot production can be illustrated by applying it to something like a Saturn rocket, where the cost per unit of service life is astronomical.)

3.4 The specification places no limitation on the operational hours during the thirty day acceptance period. The choice of numbers of hours and schedule is the customers. Some absolute minimum of hours will have to be run however for operation training at the delivery destination.

7.0 All of the points indicated will be covered by the Operational and Maintenance Manual.

9.17 The chip cassette holds 500 chips. It is the developing magazine that holds 36. There is no reason to limit the number of print copies since more than one developing magazine can be used.

Amendment I

3. The environmental conditions called out in this section are those of a typical office.

4.3.3 "Manufacturers published resolution" does refer to the film manufacturer. The number $6\sqrt{2}$ should be $\sqrt[6]{2}$.

4.3.4 Section 4 of the Amendment is only an outline or basic plan of the areas to be covered in acceptance testing. It is by no means intended to represent a detailed acceptance test specification. An Acceptance Test Specification which will cover 1) a detailed procedure for each test 2) the number of times it is to be performed, 3) type of equipment necessary to perform the test 4) equipment calibration data, (including mensuration targets) 5) and data sheets with indications of allowable tolerances for each test will be submitted for customer approval on 1 November 1966.

To specify positioning accuracy as a percentage per unit travel is impractical unless a limit is placed on the smallest increment to be tested, or unless it is accompanied by a specification for resolution. Any practical system has a lower limit of resolution set by a potentiometer (even film pots have finite resolution contrary to manufacturers claims) or backlash or a stiction to servo gain ratio or a electromagnetic interference threshold or, as in our case, a least significant digital bit. Therefore, no matter how low a system resolution is, it is always possible to pick a unit of travel so small that the unit of travel times the specified percent error per unit of travel yields an allowable error smaller than the system resolution and hence an out of spec condition.

Functional Tests - The capability of the unit to be used as a mensuration device (2.7.9) will be tested. The print rate (2.6.2) will be tested. These tests will be described in detail in the Acceptance Test Specification.

5. and Remark 2 - The ability of the unit to perform reliably is dictated by the requirement of a 90% up time during the 5000 hour life of the unit.